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Heteroallergy in Tuberculosis.—Experiments were conducted to determine whether tuberculous guinea pigs react to the intracutaneous injection of bacteria other than tubercle bacilli, and whether when desensitized they fail to react to the reinjection of the tubercle bacillus as well as to the injection of unrelated bacteria. Guinea pigs were infected with the attenuated R1 strain of tubercle bacillus, and six weeks later desensitization was instituted by the daily subcutaneous injection of increasing amounts of either synthetic medium tuberculin, broth tuberculin, concentrated uninoculated synthetic medium or concentrated uninoculated broth. The tuberculous animals that had received the synthetic medium tuberculin, as well as those that had received the broth tuberculin, were found to be desensitized, while those receiving the broth medium showed some desensitization. To determine the relationship of heteroallergy to allergy, sensitized as well as desensitized guinea pigs were injected simultaneously in the skin with suspensions of a virulent strain of *M. tuberculosis*, and an unrelated organism such as *B. coli, Staph. aureus, Br. suis, C. diphtheriae* or a diphtheroid bacterium. It was found that the sensitized tuberculous animals reacted with the characteristic acute inflammatory reaction not only to the reinjection of *M. tuberculosis*, but also to the injection of either *B. coli, Staph. aureus*, or *Br. suis*, while the inflammatory reaction to *C. diphtheriae* was masked by the acute inflammatory reaction due to the diphtheria toxin. The diphtheroid organism used in this study failed to elicit any inflammatory reaction. On the other hand tuberculous guinea pigs desensitized with tuberculin failed to show a local inflammatory reaction to the reinjected *M. tuberculosis*, while the injection of the unrelated bacteria did elicit a definite local inflammatory reaction, less marked than that observed in the sensitized animals. Nontuberculous guinea pigs were not sensitized by the repeated injections of tuberculin. The gross pathological findings in guinea pigs killed two months after infection with virulent tubercle bacilli were extensive tuberculous involvement of the spleen, liver and lungs of the control, originally uninfected animals, gross tubercles in the internal organs of the sensitized reinfected animals, and no gross tubercles in the liver in the desensitized group. Antibody formation as determined by means of the complement fixation reaction was not affected by desensitization and showed no correlation to the extent of the tuberculous process. The antibody content of the tuberculous animals was not affected by the administration of tuberculin, nor did nontuberculous animals treated with tuberculin develop any complement fixing antibodies.—*A Study of the Heteroallergic Reactivity of Tuberculin-Desensitized Tuberculous Guinea Pigs, in Comparison with Tuberculous and Normal Guinea Pigs, M. W. Higginbothem, Amer. Jour. Hyg., September, 1937, xxvi, 197.*—(*J. D. A.*)

Allergy in Pseudotuberculous Animals.—Various investigators have demonstrated the hypersensitivity of pseudotuberculous animals to intracutaneous in-

jections of the bacilli or the filtrates of cultures of the coccobacillus of Malassez and Vignal. Studies were made to determine the exact character of this sensitivity. Guinea pigs were inoculated with strains of varying virulence of this coccobacillus at regular intervals, with broth cultures of the organisms, heated for one hour at a temperature of 58° to 60°C., centrifuged and decanted. Intraperitoneal inoculations of large doses of avirulent coccobacilli incapable of producing the customary lesions of pseudotuberculosis bestowed upon the guinea pig a weak allergic sensitivity. Guinea pigs infected by the subcutaneous route with a mildly pathogenic strain of the coccobacilli showed a strongly positive allergic response to the heat-killed bacilli. Guinea pigs infected subcutaneously with virulent pseudotubercle bacilli reacted very strongly to the killed organisms with haemorrhagic and necrotic papules. When thirty-two new guinea pigs were skin tested with the bacilli, four of them showed markedly positive reactions. One of these four animals showed typical lesions of pseudotuberculosis at autopsy while the other three showed no evidence of a pseudotuberculosis. Thus it was demonstrated that the degree of the skin allergy depends upon the degree of virulence of the infecting strain, that is, the more virulent the culture the more marked is the allergic response. The allergic sensitivity of the pseudotuberculous guinea pig to the heated organisms is comparable to the reaction of tuberculous guinea pigs to tuberculin. The skin reactions of the infected guinea pigs did however lose part of their diagnostic value by the fact that enough of the control animals which were apparently free from pseudotuberculosis also showed positive reactions.—*Sur la sensitivité allergique des animaux pseudotuberculeux, P. Boquet, Compt. rend. Soc. biol., June 5, 1937, cxxv, 411.*—(*M. T. W.*)

Vaccination with Tubercle Bacilli Suspended in Oil.—Subcutaneous inoculations of dead tubercle bacilli suspended in vaseline oil confer a resistance in the guinea pig to a subsequent tuberculous infection, manifesting itself by retarding the spread and the generalization of the lesions of reinfection. This resistance was greater when a minimum dose of the bacilli of reinfection was given by the subcutaneous route. The only difference noted between the reinfected and the control animals inoculated intracutaneously was that the vaccination retarded the spread to the visceral organs. It was only when minimal doses were given that the marked effect of the vaccinating power of the oily suspension of the bacilli was noted. The suspension in vaseline oil of heat-killed tubercle bacilli produced an appreciable retardation of the dissemination of the bacilli of reinfection but this was not sufficient to confer upon the guinea pig a total immunity even when minimal doses of a reinfecting strain of moderate virulence were given. Through these experiments it may be possible to follow the relationship of allergy and immunity. Guinea pigs vaccinated with the dead bacilli suspended in vaseline oil show an immunity at least as great as those animals infected with virulent and living bacilli. This noticeable augmentation of resistance was not accompanied by a parallel increase in allergic response.—*Vaccination du cobaye contre la tuberculose avec des bacilles morts enrobés dans l'huile de vaseline, A. Saenz, Compt. rend. Soc. biol., June 12, 1937, cxxv, 495.*—(*M. T. W.*)

Allergy Produced by Tubercle Bacilli Emulsified in Oil.—With the idea of clarifying the subject of the sensitivity to tuberculin produced in the guinea pig inoculated with dead tubercle bacilli suspended in oil of vaseline, four experiments were made. In the first experiment guinea pigs with a five weeks old infection with a bovine strain of tubercle bacilli were divided into three groups. The first group received subcutaneously varying amounts of tuberculin emulsified in Ramon's mixture (oil and lanolin). The second lot received under the same conditions tuberculin in vaseline oil. The third lot received tuberculin diluted with physiological salt solution. All the animals died five to eight hours later, regardless of the diluent of the tuberculin, with classical symptoms of tuberculin intoxication. In the second experiment two groups of guinea pigs were given subcutaneously 0.000,1 mgm. of bovine tubercle bacilli. One group was inoculated with the bacilli diluted with physiological salt solution, the other lot was inoculated with the bacilli emulsified in oil of vaseline and tuberculin tested at varying intervals. The beginning and progression of the sensitivity was practically identical in the two groups of animals. Guinea pigs of each lot were sacrificed to demonstrate the extent of the infection. There was no difference in the dissemination of the bacilli throughout the animals of the two groups. In the third experiment .1 gm. of a human strain of tubercle bacilli was emulsified in normal salt solution. From this emulsion dilutions were made in salt solution and in vaseline oil so that one cc. contained 0.000,1 mgm. of bacilli. Groups of guinea pigs were inoculated with each type of suspension. Allergic manifestations

were identical with the preceding group of experimental animals. Cultures of the organs showed an initial bacillaemia, revealed by the contamination of the spleen sixteen days following the inoculation, in the two lots of animals. The fourth experiment was like the preceding one except that the animals were infected with 0.000,01 mgm. of bacilli. At the end of the seventeenth day following the infection all the animals were markedly positive to tuberculin. The animals which had received the organisms suspended in physiological salt solution showed a more rapid dissemination of bacilli than those animals inoculated with the oily suspension of bacilli. It was thus seen from these experiments that, whether bovine or human strains of tubercle bacilli were used, there was a difference in the degree of allergy or dissemination of bacilli throughout the body only when minimum doses of bacilli were inoculated. The vaseline oil modified the terrain at the site of inoculation without augmenting the intrinsic value of the antigen provoked by the local inflammatory phenomena. This favored the intervention of the cellular elements responsible for allergy and immunity.—*Sur le méchanisme de l'augmentation de l'allergie produite par l'enrobage des bacilles morts dans l'huile de vaseline, A. Saenz, Compt. rend. Soc. biol., June 26, 1937, cxxv, 714.*—(*M. T. W.*)

Vaccination with Oily Suspension of Tubercle Bacilli.—Previous studies have been made to determine the fate of virulent tubercle bacilli of reinfection when given subcutaneously into guinea pigs vaccinated with killed bacilli suspended in vaseline oil. The question arose as to the dissemination of bacilli of reinfection when given intracutaneously into guinea pigs similarly treated. Consequently a series of guinea pigs was vaccinated with heat-killed tubercle bacilli of bovine type suspended in vaseline oil. About fifty-one days later these animals all reacted strongly to tuberculin skin tests. This lot of guinea pigs was divided into two lots. The first lot of animals along with an equal number of control animals was inoculated intracutaneously with 0.000,1 mgm. of virulent tubercle bacilli of a human strain. The second lot, together with control animals, was given in identical manner virulent bovine type tubercle bacilli. Irrespective of the type of strain of the bacilli the reactions were the same. Twenty-four to forty-eight hours later a small oedematous red papule appeared analogous to an allergic response. A few days later this became a necrotic nodule. The control animals presented signs of a typical infection of a virulent inoculation. Then the difference between the reinfected and primary infected guinea pigs began to manifest itself. In the reinfected animals the nodule became smaller and smaller until all that remained was a scar. In the control animals the nodule became larger and ulcerated until in about three weeks a chancre had developed. Reinfected and control animals were sacrificed at varying intervals from six to thirty-nine days following the infection. Organs were cultured up to the point where macroscopical lesions appeared. Results showed clearly a delay in the dissemination of the bacilli of reinfection in the vaccinated animals as compared with the control animals. In the control animals the bacilli reached the neighboring lymph nodes in six days and the spleen in thirteen days. In the vaccinated guinea pigs bacilli could not be found in the spleen at the end of the thirty-ninth day when the experiment was terminated. There was however one exception. Bacilli were found in the spleen of one animal twenty-five days after the reinfection. A comparative analysis showed that in guinea pigs vaccinated with killed tubercle bacilli suspended in vaseline oil both subcutaneous and intracutaneous inoculations of virulent bacilli behaved in about the same manner. The transit of the bacteria of reinfection was noticeably retarded in the vaccinated animals when compared with animals receiving a primary infection of the same virulent tubercle bacillus.—*Dispersion des bacilles de surinfection inoculés par voie intradermique chez cobayes preparés avec des bacilles tuberculeux morts enrobés dans l'huile de vaseline, A. Saenz, Compt. rend. Soc. biol,. May 8, 1937, cxxv, 98.*—(*M. T. W.*)

Sensitization and Antibody Formation with Tubercle Bacilli in Oil.—The authors confirmed the observations of Couland and others that paraffin oil added to a suspension of killed tubercle bacilli intensifies their sensitizing capacity. In rabbits and guinea pigs heat-killed tubercle bacilli incorporated in paraffin oil produce a higher concentration of complement fixing antibodies than a similar amount of killed bacilli incorporated in salt solution. In rabbits this sensitization and antibody formation are more pronounced with heat-killed tubercle bacilli than with BCG. The sensitization and complement fixing antibodies persist in the guinea pig for twenty months after such treatment.—*Sensitization and Antibody-Formation after Injection of Tubercle Bacilli and Paraffin Oil, J. Freund, J. Casals & D. P. Hosmer, Proc. Soc. Exper. Biol. & Med., December, 1937, xxxvii, 509.*—(*M. B. L.*)

Vaccines of Tubercle Bacilli in Oil.—It is possible to establish in the guinea pig and rabbit an intense lasting allergic state by the inoculation of tubercle bacilli suspended in paraffin oil. That this allergic state has persisted after the excision of the localized abscess at the site of inoculation is probably due to the fact that microscopical fragments of the oil have migrated to the lymph nodes or lungs. To demonstrate this fact guinea pigs were inoculated with paraffin oil containing dead bovine tubercle bacilli. At the end of twenty-four to forty days the largest lesions were observed. The lungs were covered with little gray nodules. The cervical lymph nodes were hypertrophied with a few yellow nodules full of pus and bacilli. Microscopically in the lymph nodes giant cells were found and occasionally a necrotic area. There were a few typical tubercles. In the lungs were found small granulations and epithelioid islets, sometimes composed of giant cells, infiltrated or surrounded by lymphocytes. In the centre of the nodule there was a little core frequently surrounded by bacilli. Furthermore, polaroscopic examination revealed luminous crystals of paraffin in both the lymph nodes and the lungs. A second experiment using killed bovine bacilli emulsified in oil of vaseline was performed. From the sixth day lesions began to appear. They increased and assumed much the same character as those in the former experiment, with giant cell formation, islets of epithelioid cells surrounded by lymphocytes and even abscess formation with caseation and droplets of oil. Inoculations of tubercle bacilli in physiological salt solution did not produce parallel lesions. Inoculations of BCG however in vaseline oil did produce much the same picture as inoculations of bovine bacilli. Inoculations of vaseline or paraffin oil without the bacilli produced only slight and inconstant regional adenopathy. The lesions produced by the oily suspensions of killed tubercle bacilli resembled granulomata more than authentic tubercles. Nevertheless the dispersion and fixation of the dead bacilli in various parts of the organism can explain the marked and lasting state of allergy of the inoculated animal and the relative immunity thus conferred to a subsequent tuberculous infection.—*Lésions ganglionnaires et pulmonaires produites chez le cobaye par inoculation de bacilles tuberculeux morts enrobés dans la paraffine ou l'huile de vaseline, N. Rist, Compt. rend. Soc. biol., October 16, 1937, cxxvi, 185.*—(*M. T. W.*)

Artificial Immunity in Tuberculosis.—Quantitative evaluation of tuberculosis from the standpoint of the bacilli and the disease are essential to an understanding of this chronic disease. Almost anything can be proved if one uses forced, extreme experimentation, or if one restricts observations to a monocentric viewpoint (for example, anatomical or statistical studies alone). From quantitative studies, a criterion of immunity and of virulence has been established. The criterion of a specific immune agent is one that will produce a decided relative protection to infection with small or reasonably large amounts of a virulent strain of tubercle bacilli as compared with a control animal either not protected or also similarly injected primarily with an equal amount of heat-killed bacilli. The criterion of avirulence of a strain of human or bovine tubercle bacilli requires that a definite amount injected into an animal susceptible to the strain in question, should not produce a lesion greater than that produced by an equal amount of nonviable bacilli of the same strain. There must be no evidences of multiplication of the bacilli at the site of inoculation or in the internal organ. It has been shown previously that the first contact with virulent or avirulent tubercle bacilli leads to an immunity in the sense of a changed or protective reaction to subsequent infection, which benefits the infected animal. Two conceptions oppose the use of artificial immunization with viable avirulent tubercle bacilli in man. One contends that the possibility exists that viable avirulent bacilli may become virulent. This opinion is opposed by recent experimental studies. The second objection concerns the question of an increased susceptibility to a second infection, based on the supposed observations that the "childhood" type of disease is always benign, and that reinfection tuberculosis is progressive and malignant. In the absence of quantitative data regarding the number of bacilli necessary to elicit such reactions, and the reactive state at the time of occurrence, the opinion as to whether such greater susceptibiliy exists should be reserved. By means of the use of avirulent tubercle bacilli it is shown that there exists a changed tissue reaction induced by the first injection of viable (but not by nonviable) tubercle bacilli which is evident on the subsequent injection of nonviable or viable avirulent tubercle bacilli given in amounts above the threshold of tubercle formation. This change to a greater reaction erroneously appears to be a paradox when viewed in the light of the immune reaction (in which case small infections with virulent tubercle bacilli are completely prevented and dissemination with larger infections are definitely retarded as compared with non-

immune controls). It is coincidental with the immune reaction to tubercle forming amounts of tubercle bacilli, but whether it is synonymous with the immune reaction has not been definitely established. Study of this phenomenon by injection by various routes of measured quantities of bacilli at various periods after primary injections shows that this factor of protein hypersensitiveness very probably only comes into play spontaneously when large amounts of tubercle bacilli are resident in the body, as it is almost inconceivable that these can enter from the outside in sufficient quantities to play a part in the course of the disease in man by provoking such reactions. For this protein intoxication does not become evident until large amounts of tubercle bacilli are either injected or disseminated internally.—*Specific Artificial Immunity in Tuberculosis, H. J. Corper, M. L. Cohn & A. P. Damerow, Amer. Jour. Clin. Path., September, 1937, vii, 360.*—(*A. E. M.*)

Vaccination with Heat-Killed Tubercle Bacilli.—In the experiments reported an attempt was made to determine if inoculation with heat-killed tubercle bacilli is an effective means of protection against tuberculous infection and to compare the results with those obtained with BCG. Rabbits were employed because they are much more resistant to infection with human or bovine tubercle bacilli than guinea pigs. This applies especially to a breed of rabbits known as the Havana brown. Virulent strains of human and bovine tubercle bacilli were used. The BCG strain was originally obtained from the Pasteur Institute in Paris and since grown on its appropriate medium. The tubercle bacilli used for vaccinating were grown on glycerine agar instead of the usual egg mediums in order to exclude the possibility of sensitization with egg protein. Suspensions of bacilli were usually killed by exposing to a temperature of 100°C. for one-half hour in the Arnold steam sterilizer. The sterility of each lot of vaccine was tested by guinea-pig inoculation. In a few experiments vaccine heated at 60°C. for half an hour was used. A large number of animals were employed, as many as 150 in some of the experiments. All animals surviving more than two years were sacrificed and examined. Although recovery from the disease is the best criterion of resistance conferred by protective inoculation, the prolongation of life, as compared with the controls, of animals that succumbed was also considered as evidence of resistance. The usual procedure was to vaccinate the animals with repeated doses of heat-killed tubercle bacilli followed by an infecting dose of virulent bovine tubercle bacilli administered intravenously. This dose was necessarily small ranging from 0.001 to 0.000,01 mgm. but sufficient to cause death in ali the controls. In some of the experiments a like group of rabbits was vaccinated with BCG in the same dosage as the heat-killed bacilli for direct comparison. Eleven groups of rabbits were treated using a variety of dosage of the vaccinating bacilli also heat-killed bacilli in combination with various agents such as horse serum, sheep serum, turtle bacilli, typhoid vaccine, etc., on the basis that one antigen may accelerate the production of antibodies by another. The results of the experiments are given in various tables and graphs and indicate that repeated doses of heat-killed tubercle bacilli cause an increased resistance to infection with virulent tubercle bacilli only slightly less than that produced by vaccinating with BCG. Addition of certain antigens, notably heated horse serum, to the killed bacilli increased this protection so that it was approximately the same as that afforded by BCG. This method of "vaccinating" eliminates the dangers necessarily incident to the introduction of living bacteria into the body, a point to be considered in the immunization of susceptible persons exposed to tuberculous infection.—*An Experimental Study of Protective Inoculation with Heat Killed Tubercle Bacilli, E. L. Opie & J. Freund, Jour. Exper. Med., December 1, 1937, lxvi, 761.*—(*J. S. W.*)

Fate of Bacilli of Reinfection in Tuberculous Rabbits.—To complete the studies already reported on the dispersion of bacilli of reinfection in the organs of tuberculous rabbits further experiments were made. In the first series of experiments rabbits were given intracutaneous inoculations of an S type of a bovine strain of tubercle bacilli so virulent that infections by the same route produced generalized tuberculosis and death in four to five months. At the end of fifteen days when granulations were commencing to be clearly visible these animals and an equal number of control animals were given intravenous inoculations of an R strain of human tubercle bacilli which had been previously shown tc produce regularly in a few weeks extensive pulmonary lesions when inoculations were made intravenously. At intervals from six to sixty days a reinfected and a control animal were sacrificed. Pieces of lung, spleen and kidneys were aseptically collected, concentrated and cultured. In a second series of experiments, rabbits were infected as in the preceding experiment but were given inoculations sixty days later of an equally virulent R strain of bovine tubercle

bacilli. Control animals were likewise observed. At autopsies made at varying intervals fragments of the organs were again collected, concentrated and cultured. From the two series of experiments it was observed that contrary to the behavior of bacilli of reinfection in guinea pigs, the reinfecting bacilli spread not only to the lungs but to the spleen and kidneys as well. The bovine bacilli were more rapidly eliminated or destroyed than the human type of tubercle bacilli. This tended to show that in tuberculosis of the rabbit the immunizing processes were strictly specific. Likewise it was shown from these studies that the spleen and kidneys of the animals infected for several weeks with virulent bovine bacilli contained only a few organisms, while those organs had been as heavily seeded as the lungs from the beginning of the bacillary dispersion by means of the blood-stream, that is to say between the eighteenth to the twenty-fifth day after the intracutaneous inoculation. The evolution of the primary intracutaneous infection was not modified by the virulent reinfection.—*Sort des bacilles d'épreuve dans les organes des tuberculeux surinfectés par voie veineuse, A. Boquet & R. Laporte, Compt. rend. Soc. biol., April 24, 1937, cxxiv, 1267.*—(*M. T. W.*)

Vaccination of Guinea Pigs with Tubercle Bacilli.—Five different types of tubercle bacilli were used to vaccinate guinea pigs in the attempt to protect them against reinfections with virulent bacilli. The strains used were BCG, which when given in large doses subcutaneously produced only a localized abscess, a bacillus (R1) with a virulence only slightly greater than BCG, a slightly pathogenic avian tubercle bacillus (strain C), an avian tubercle bacillus with moderate virulence, and a bacillus which was apathogenic for the rabbit and the chicken in large intravenous doses and pathogenic for the guinea pig in doses of 5 mgm. when given intravenously. BCG was given to the guinea pigs in single and interval doses of 10–15 mgm. intracutaneously. The vaccinated animals together with control animals were inoculated subcutaneously with 0.000,2 mgm. of a moderately virulent strain of tubercle bacilli. The vaccinated and reinfected guinea pigs showed at autopsy five months later far fewer lesions than did the control animals which all showed generalized tuberculosis at the end of a month. Vaccinated animals inoculated with 0.000,02 mgm. of the same strain showed only splenic, hepatic and disseminated pulmonary granulations. BCG emulsified in Ramon's mixture (lanolin and oil) was shown to have no protective power against the organisms of reinfection. Another series of guinea pigs was inoculated under the skin with 1–3 mgm. of strain R1 and reinfected six weeks later as in the preceding experiment. The animals showed inguinal and sublumbar adenitis and a few granulations in the spleen. Protective doses of strain R1 emulsified in Ramon's mixture produced the same results. In the third experiment fifteen guinea pigs were given 4 mgm. subcutaneously of strain R1. The animals were reinoculated with very virulent bovine tubercle bacilli. Results were variable. One animal died of generalized tuberculosis at the end of four months as did all the controls. Granulations in the spleen of one animal appeared in four months while the remaining animals presented at autopsy after five months only a few glandular enlargements, with no gross visceral lesions. Guinea pigs inoculated with 1 mgm. intravenously of strain R1 were reinoculated six weeks later with virulent human tubercle bacilli. Ten to eleven months later the animals died of generalized tuberculosis while the control animals were dead of generalized tuberculosis in ten to fourteen weeks. In the fourth experiment vaccination was made with subcutaneous doses of avian tubercle bacilli (strain C) and reinfected with 0.000,05 mgm. virulent tubercle bacilli of human type. Animals sacrificed about three to five months later showed numerous lesions in the spleen, liver and sometimes in the lungs. Control animals died ten to fourteen weeks with generalized massive lesions. In the final experiment of this series 20 mgm. of avian tubercle bacilli of a very weak virulence were inoculated subcutaneously at intervals. Reinfections were made with the same strain of human bacilli as in the preceding experiment. These animals showed caseous regional lymph nodes, a few splenic granulations, enlarged tracheobronchial nodes and a few pulmonary tubercles. These experiments confirm once more the fact that attenuated tubercle bacilli of human or bovine strains confer a specific immunity in the guinea pig the more marked as the weakness of their virulence is less marked. The immunity conferred by living attenuated bacilli is greater than the immunity produced by dead tubercle bacilli. Animals vaccinated by two or three injections of BCG or strain R1 did not have any better immunity than those animals given only single doses. The intravenous method of immunizing was at least as effective as the subcutaneous method.—*Essais de vaccination du cobaye contre la tuberculose par des bacilles humains et bovine de virulence atténuée et par des bacilles aviaires, A. Boquet*

& R. Laporte, Compt. rend. Soc. biol., May 1, 1937, cxxv, 19.—(M. T. W.)

Vaccination against Tuberculosis.—Attempts were made at protection against a tuberculous infection in rabbits by vaccinating them with various types of tubercle bacilli and BCG. Five different strains were used, living human tubercle bacilli which were avirulent for the rabbit, avian bacilli, S type of bovine tubercle bacilli and bacilli killed by heat and by cold with alcohol and treated with ether. The tubercle bacillus used as a reinfecting agent was a virulent bovine strain which produced death in the rabbit by intravenous inoculation of 0.000,000,1 mgm. Rabbits were all given immunizing doses of the various vaccines and inoculated at varying intervals from one month to nine weeks later by intracutaneous injection. The conclusions drawn were that BCG, living human tubercle bacilli and in a less degree the S type of bovine bacilli killed by heat augmented the resistance of the rabbit against a tuberculous infection. But as with the guinea pigs under analogous circumstances immunizing inoculations do not afford a true protection to a virulent infection but manifest themselves by a slowing up of the generalization of the infection and by an abatement of the extension to the visceral foci. The attenuated human bacilli and avirulent avian bacilli were less efficacious than the virulent human bacilli and BCG. Rabbits vaccinated by the tracheal route with killed R variant of a bovine strain showed only a mild resistance to a reinfection by the same route. Vaccination with bacilli killed by cold in alcohol and treated with ether produced only a slight retarding of the evolution of the experimental tuberculosis.—*Essais de vaccination du lapin contre la tuberculose par des bacilles humains virulents ou atténués, des bacilles bovins atténués (BCG), des bacilles aviaires atténués et des bacilles morts, A. Boquet & R. Laporte, Compt. rend. Soc. biol., May 1, 1937, cxxv, 23.—(M. T. W.)*

Immunization with Lindner and Oelrich's Vaccine.—Bacilli are first extracted with alcohol and ether, then with water. The watery extract is heated in the steam bath in the presence of alkali. The insoluble residue is used as the vaccine. Selter treated guinea pigs with varying amounts of this substance and four weeks later infected these animals together with controls with minimal quantities of virulent tubercle bacilli. At varying intervals following infection the lymph nodes and organs of both groups were cultured. It was found that in the vaccinated animals there was a definite retardation of growth of the bacilli as compared with that of the controls. Similarly the disease was definitely retarded in a proportion of the experimental animals. In no case, however, was the acquired resistance sufficient to prevent infection even with 0.000,001 mgm.—*Immunisierungsversuche mit dem Tuberkelbazillen-Impfstoff von Lindner und Oelrichs an Meerschweinchen, H. Selter, Ztschr. f. Immunitätsforsch., July, 1937, xc, 472.—(M. B. L.)*

S Variant and Allergy.—In view of the current opinion that guinea pigs inoculated with killed tubercle bacilli react to tuberculin in a weak and inconstant manner experiments were performed using heat-killed R and S variants of two different known laboratory strains and living BCG. Guinea pigs were inoculated under the skin with 0.01 gm. of R and S variants of the two strains, killed by heating for one hour at 75°C. and bacilli killed in .3 per cent formalin. With each of these series guinea pigs were inoculated with BCG and observed at the same time. Fifteen days after the inoculation the animals were tuberculin tested. The heat-killed S variants of the two strains possessed a power of sensitizing the guinea pig to tuberculin to a degree even greater than the R variant of the same strain. In some instances inoculations of S variants produced a greater sensitivity than BCG.—*Sensibilité a la tuberculine chez le cobaye inoculé avec des bacilles de la variété S des souches "Bov. Cer." et "H. Ratti" tués par la chaleur, M. Nasta, Compt. rend. Soc. biol., May 22, 1937, cxxv, 302.—(M. T. W.)*

Bactericidal Power of Tuberculosis Serum.—The bactericidal power of the serum of 77 cases of tuberculosis was tested on the homogeneous culture of tubercle bacilli of Arloing. It was found that the mortality from tuberculosis of those that had little if any bactericidal power in their serum was 50 per cent, whereas the mortality of those whose sera had a strong bactericidal action was only 13.3 per cent.—*Importance clinique de la recherche du pouvoir bactéricide du sérum des tuberculeux, P. Courmont & A. Gardère, Rev. d. l. tuberc., March, 1937, iii, 312.—(M. B. L.)*

Antigenic Nature of Tubercle Bacillus Polysaccharides.—The lipoids of dried and pulverized tubercle bacilli were thoroughly and repeatedly extracted with several lipoid solvents. The proteins were removed by air passage and precipitation with chloroform. The polysaccharides were precipitated with alcohol. Other preparations were made

after additional, more drastic preliminary treatment with normal sodium hydroxide. Complement fixation and precipitin tests with these polysaccharides against tuberculous sera failed to show any reaction. Yet identical procedures used in the preparation of yeast polysaccharides yielded highly active substances. The authors conclude, therefore, that the positive results obtained with polysaccharides of the tubercle bacillus by other workers may have been due to the presence of impurities of protein or lipoid in their preparations.—*Zur Frage der antigenen Natur der Tuberkelbazillen-polysaccharide, F. Klopstock & A. Vercellone, Ztschr. f. Immunitätsforsch., July, 1937, xc, 507.—(M. B. L.)*

Reinfection with R and S Variants.—Guinea pigs infected with an R variant of two known laboratory strains (strains Bov. Cer. and H. Ratti) were reinfected intracutaneously with R and S variants of the same strains as the original infection in order to observe any difference of reaction of the phenomonon of Koch in the reinfected animals. Animals reinfected with the R and S variants of the two strains fifteen days following the primary infection showed reactions approximately the same as the control animals. This was due in all probability not to an allergic phenomenon but to the virulence or toxicity of the bacilli. With the guinea pigs reinfected in the same manner thirty-four days later a marked difference was seen in the reactions of the tuberculinized guinea pigs reinoculated with the two strains. Reinoculation of the two R variants produced the typical Koch's phenomenon as did reinoculations of BCG. Reinfections with the two S variants produced inflammatory or only slightly inflammatory reactions. One strain (strain H. Ratti), as in the former series, produced more marked reactions that the other strain. A third reinfection fifty-four days following the primary infection gave practically the same results, an absence of the phenomenon of Koch with the S variant and a definite reaction with the R variant. The difference of reactions between the R and S variants depends upon whether the animals possess the power of resistance against the reinfection of the particular variant reinoculated.—*Réaction du cobaye tuberculeux à la réinfection par voie intradermique avec des bacilles de la variété R et S des souches "Bov. Cer." et "H. Ratti," M. Nasta, Compt. rend. Soc. biol., May 22, 1937, cxxv, 304.—(M. T. W.)*

Acetone Extract of Tubercle Bacilli.—Two extracts were used for the experiments. Both extracts were made exactly according to the method employed for many years by the Pasteur Institute. One extract was prepared with an eugonic bovine bacillus (R type). The other was made from a mixture of S avian strains and some S cultures from various sources which were avirulent for the guinea pig but had a low virulence for the rabbit. Each extract was injected intravenously into two rabbits, eleven injections of 5 cc. each at varying intervals. During the course of injections, pulse, temperature, leucocytic index and leucocyte counts of each animal were recorded. There was little difference in the behavior of the two extracts. The pulse remained stationary or showed a slight increase. Temperatures remained normal. Each injection was followed by a slight rise in the leucocyte count. After the treatments were discontinued there was a rise of the pulse rate and the animals remained well. These results did not agree with those published by A. Boquet and L. Nègre in 1929 whose three animals treated similarly failed rapidly, two of which died. The mode of preparation of the acetone extracts of the tubercle bacilli was exactly the same in this series of experiments as it had been in the earlier experiments of 1929. But it was learned that the industrial manufacturer was using a different method in the preparation of the acetone. Further studies will be made to try to explain what rôle was played by the quality of the acetone in the active influence of these extracts.—*Recherches sur les effets des injections intraveineuses répétées d'extrait acétonique de bacilles de Koch chez le lapin neuf, F. van Deinse & E. Loukidis, Compt. rend. Soc. biol., February 6, 1937, cxxiv, 424.—(M. T. W.)*

Antigens in Tuberculous Tissue.—Rabbits were injected with increasing amounts of fresh or cooked watery extracts of bovine caseous pneumonic lungs. Their antisera reacted in the complement fixation and precipitin tests with watery extracts of caseous human and bovine tissue, but not with similar extracts of unaltered organs from these cases. However, these antisera did react with alcoholic or ethereal extracts of grossly unaltered organs derived from human beings with pulmonary tuberculosis or those having extensive suppurative processes of a nonspecific nature. No complement fixation or precipitation was demonstrable with these antisera on similar extracts of organs derived from individuals who had neither tuberculosis nor chronic suppurative processes.—*Ueber den serologischen Nachweis von Käse-bzw. Eiterantigenenen in makroskopisch unveränderten Organen bei*

der kavernösen Tuberkulose der Lungen, L. Dmochowski, Ztschr. f. Immunitätsforsch., May, 1937, xc, 363.—(M. B. L.)

Haematogenous Tuberculous Reinfection.—Though the fact that tubercle bacilli become fixed in areas of allergic inflammation is well established, the behavior of the noninflammed hypersensitive lung tissue under similar circumstances is not definitely known. With this in mind the authors carried out experimental work. Fourteen dogs that had a negative reaction to 1 mgm. of Old Tuberculin received an intramuscular injection into the thigh of 0.3 to 1 mgm. (depending upon the weight of the dog) of a two months' culture of human tubercle bacilli. The dogs showed no reaction to the injections. Six weeks following the first injection the right lung of eight dogs was made hypersensitive by repeated intrapulmonary injections of tuberculin beginning with 0.000,1 mgm. and increasing the dose to 0.1 mgm. The left lungs were injected with normal saline at the same time when tuberculin was injected into the right lungs, in order to eliminate trauma as a source of error. At various intervals following the last tuberculin injection, 1 to 3 mgm. of a two weeks' culture of tubercle bacilli, of a similar strain used at the beginning of the experiment, were injected intravenously. All dogs showed a febrile reaction and were autopsied fifteen to twenty days later. At autopsy miliary nodules were found in both lungs and in the abdominal viscera. The intensity of the infiltration (number of tubercles) was greatest in six dogs in the right sensitized lung, markedly less in the left nonsensitized lung and very few tubercles were found in the abdominal viscera. Two dogs showed an equal distribution of tubercles in both lungs. The authors realize that the experiment does not similate the complexity of those pathological conditions which are responsible for the development of zones of hypersensitivity in the human. They conclude that areas of hypersensitivity in the lungs aid in the development of haematogenous metastases.—*The Rôle of Areas of Hypersensitivity in Experimental Haematogenous Reinfection, V. A. Ravitch-Stcherbo & L. D. Steinberg, Probl. Tuberk., no. 11, 1936, 1472.—(W. A. Z.)*

Failure of Allergic Inflammation to Protect against Virulent Infection.—The actual part that inflammation plays in causing bacterial localization is still a moot question. If the mechanical barrier effected by inflammation hinders the spread of infection, then the accelerated development and greater intensity of the reaction in allergic inflammation should tend to localize bacteria near the portal of entry more rapidly and more effectively. In the field of tuberculosis the belief is general that, due to allergic inflammation, there is a more effective walling off of tubercle bacilli in reinfection than in primary infection. Recently, however, evidence has been presented which suggests that the primary factor in the localization of bacteria is the interaction of the bacteria and the tissues whereby the former fail to grow and spread freely; and the inflammatory reaction is more of a supplementary process reinforcing the operation of bacterial localization. From an experimental standpoint in determining the value of inflammation in bacterial localization, it should be produced at the time or shortly after the bacteria enter the tissues, and not be preëxistent. The present paper describes experiments performed to test the assumption that the inflammatory reaction, *per se*, can protect a susceptible animal (rabbit) against infection with a virulent microörganism (*Pneumococcus* type I), and to determine whether the intensified inflammatory reaction of allergy is comparable to the inflammatory response of acquired immunity in protecting an animal against an otherwise lethal infection. Fifty rabbits were used as follows: some were sensitized to egg albumin by a series of subcutaneous injections until they became Arthus-positive; others were similarly prepared but were also immunized against a type I pneumococcus by injection of formol-killed cultures; a third group was immunized in the same way against the pneumococcus but was not sensitized to egg albumin, and a fourth group served as control. The essential experiments consisted in mixing various dilutions of young broth cultures of the pneumococcus with egg albumin, injecting the mixture subcutaneously, and observing the development of the inflammatory lesion, the histopathological changes occurring therein, and the fate of the animal. Results as summarized by the authors: As few as 4 pneumococci when suspended in 5 per cent egg albumin and injected subcutaneously caused the death within from 36 to 40 hours of all of the normal rabbits as well as those allergic to egg albumin. Allergic inflammation, therefore, failed to protect the rabbit against infection with virulent microorganisms. The pneumococci, furthermore, grew profusely in the areas of allergic inflammation, and spread evenly through the oedematous field of inflammation. Phagocytosis, although moderately active, did not modify the course of the infection either in time or degree, and the pneumococci grew

freely in the exudate itself. In other words, local conditions in the field of inflammation had no determining influence ultimately on the course of the infection. The pneumococci also grew freely for a time in the lesions of rabbits both allergic to egg albumin and immune to the pneumococcus, but the microorganisms tended to remain localized near their sites of introduction. Here they developed into isolated colonies or became swollen, with prominent capsules, suggesting the appearance of a positive Neufeld reaction. Many of them lost their Gram-positive characteristics, presumably as a result of the extracellular action of antipneumococcic immune substances in the oedema fluid. The animals, however, suffered no serious effects from the infection. The lesions in actively immunized rabbits were small and inconspicuous after from 36 to 40 hours. Leucocytes were assembled in clusters in the area of infection but contained very few visible pneumococci, indicating the superiority of specific immunity over nonspecific inflammation, whether normergic or allergic, in restricting the growth and spread of the microörganisms through the tissues. These experiments, therefore, offer no support to the view that an inflammatory reaction can develop quickly enough to prevent the escape of virulent bacteria from their site of lodgment in previously noninflamed tissue and cast further doubt on the validity of the hypothesis of a mechanical "walling off" as an important mechanism for bacterial fixation in a nonimmune animal.—*The Failure of Allergic Inflammation to Protect Rabbits against Infection with Virulent Pneumococci, P. R. Cannon & G. Hartley, Jr., Amer. Jour. Path., January, 1938, xiv, 87.*—(*J. S. W.*)

Allergy and Immunity in Tuberculosis.—A single intracutaneous inoculation of 10 mgm. of living or heat-killed BCG and of *Mycobacterium caviae* (an acid-fast organism of the "S" variety which is often found in normal guinea pigs at the Pasteur Institute) confers a statistically significant resistance against a reinfection with about 600 virulent bovine tubercle bacilli, as well as a high degree of tuberculin allergy. Tubercle bacilli killed at 65°C. retain their allergizing and immunizing properties, but when heated at 119°C. they lose both these properties. Allergic and desensitized guinea pigs show significantly less extensive caseation and general tuberculous changes on reinfection than those that retain their allergy. The author proposes the term "iathergy" for the allergic animal that has been desensitized. He maintains that the iathergic individual possesses a statistically significant greater resistance against superinfection than the allergic. Immunity and allergy are therefore independent, though concomitant phenomena. They are brought into being by different antigens. It is therefore possible to abolish the necrotizing properties by treatment with tuberculin, without lessening the bacteriostatic and tuberculosis-inhibiting qualities of the acquired immunity.—*Allergy and Immunity in Experimental Tuberculosis. II. Statistical Interpretation of the Degree of Tuberculosis in the Superinfected Allergic and Desensitized Anergic ("Iathergic") Guinea Pigs, K. Birkhaug, Acta tuberc. Scandinav., 1937, xi, Fasc. 3–4, 199.*—(*M. B. L.*)

Influence of Allergy on Tuberculous Lesions.—In all the so called infectious granulomata (including tuberculosis) focal tissue reactions characterized by a predominance of large mononuclear phagocytes are the rule and in this same group of diseases bacterial allergy—defined as the first stage of the immune response to parenteral antigen, characteristic only of active as contrasted with passive immunity—is most regularly and persistently present and most highly developed. Such a constant association of a morphological picture with an immunological state suggests, either that the presence of granulomatous lesions predispose to the development of a high degree of bacterial allergy, or that bacterial allergy determines a focal mononuclear type of cytological response on the part of the host. The present work was undertaken to study the latter assumption. If such a theory is tenable it must be demonstrable (*1*) that the granulomatous lesions are not essential to the development of the delayed type of allergy, and (*2*) that tuberculin sensitivity develops at least as early as the appearance of the characteristic histological picture in the initial tuberculous lesion. The first of these points has already been demonstrated by one of the authors (Dienes). The present experiments are, therefore, devoted to testing the second of the imposed conditions. In guinea pigs with massive primary infections of the peritoneal cavity or testicles, reinfection lesions were produced on successive days and the animals simultaneously skin tested for tuberculin sensitivity. This tuberculin used for these tests was unheated synthetic-medium tuberculin in the dosage of 0.01 cc. This procedure gave no reaction in uninfected guinea pigs. At appropriate intervals (days) the animals were killed and the lesions—primary infections, reinfections and tuberculin reactions—were compared histologically. The criterion for a positive tuberculin reaction was a constant and significant

mononuclear infiltration. In one preliminary series of pigs 20 mgm. of the R1 strain of tubercle bacilli was injected intraperitoneally and at the same time a small dose was given intracutaneously. The pigs were killed on the 2nd, 3rd, 4th, 6th, 7th and 9th days. Each pig was also injected intracutaneously with a small dose of bacilli the day before death. Up to the third day the peritoneal lesions microscopically showed a polynuclear reaction. On the third day mononuclear cells began to predominate and from the 4th day onward fibroblastic proliferation was evident which rapidly resulted in the development of abundant granulation tissue. The skin lesions in the 3 day pigs showed an essentially polymorphonuclear infiltration with very few mononuclears present. Reactions from the 4th day on—the 24 hour as well as the older reactions—were entirely different in character. Although polynuclear leucocytes were still abundant the surrounding tissue showed an extensive monocytic reaction. With the use of the tuberculin test in further series of pigs definite positive reactions both grossly and microscopically were usually obtained by the 4th day signifying the simultaneous development of allergy and the arrival of the mononuclears. Thus it is shown that, under the conditions of the experiment, a very close parallelism exists between the appearance of demonstrable tuberculin sensitiveness and the shift from a purulent to a granulomatous infiltration of the tissues. In view of the fact that the tuberculin reaction can only be read twenty-four hours after it is performed, exact determination of the time factors are scarcely feasible. It is, however, fair to assume that during this period the degree of hypersensitivity has been progressively and rapidly increasing. Despite the errors of method it is not unreasonable to conclude that the hypersensitivity and alteration in the character of the histological response do, at least, appear simultaneously and this fact lends support to the authors' thesis that bacterial allergy is responsible for the early granulomatous reactions in the host observed in the experiments. It is pointed out, however, that in the usual spontaneous tuberculosis of man or animal allergy may not be the only cause of mononuclear infiltration or of granulomatous reactions. The tissue response to the lipoids of the tubercle bacillus must be considered.—*The Influence of Allergy on the Development of Early Tuberculous Lesions, L. Dienes & T. B. Mallory, Amer. Jour. Path., November, 1937, xiii, 897.*—*(J. S. W.)*

Antibody against BCG.—In order to test the specific antibody production two series of rabbits were inoculated with BCG in various manners and with varying doses. In the first series the animals were divided into three lots. The first lot received 2 mgm. of BCG in one dose. The second lot received the bacilli in small doses every day for seven days, injected in different parts of the abdomen while the third lot received BCG in the same dosage for seven consecutive days but in one place, under the skin of the abdomen. A second series of rabbits was divided into two lots. The first group received subcutaneously on alternate sides of the abdomen five injections of BCG totaling 2 mgm. of bacilli. The second lot of rabbits was given on five consecutive days the same amount of BCG but in different parts of the abdomen. The rabbits which received BCG on consecutive days in the same place or in two places all showed marked localized reactions, while the others showed no reaction at the site of inoculation. The blood of all the animals was tested for specific antibodies and the following conclusions were drawn. Antibodies appeared more slowly, were of lower titre and disappeared more rapidly in the blood of the rabbits receiving single doses of two mgm. of BCG than in the animals which received 1.4 mgm. in fractional doses and in different parts of the body. So many rabbits in the second experimental series died of intercurrent infections that no definite conclusions could be drawn. However it may be concluded that the method of fractional dosage of BCG often repeated and introduced into the rabbit by the subcutaneous route produced more rapidly a serum richer in specific antibodies than an injection of a single dose, even larger than the combined fractional dose.—*De la production des anticorps au moyen de l'immunisation "concentrée" avec le BCG chez le lapin, R. Schwartz, Compt. rend. Soc. biol., January 15, 1938, cxxvii, 100.*—*(M. T. W.)*

Blood Picture in Pulmonary Tuberculosis.—The most commonly used criteria are the total and differential leucocyte counts, the Arneth count or one of its modifications, and the erythrocyte sedimentation rate. In the lecucocyte response there are three "key cells," the neutrophile, the lymphocyte and the monocyte, the last of which Sabin and her American coworkers regard as a liability, while the function ot the lymphocyte is certainly reparative. Thus, the monocyte represents tubercle formation, the neutrophile, tubercle undergoing necrosis or abscess formation, and the lymphocyte representing the healing phase. There are no fixed normal values and Shaw has shown that two leucocytic tides occur each day, with a variation of 2000 or more per cc., the

neutrophiles being especially affected, regardless of food or exercise. Nuclear counts of neutrophiles comprise the original Arneth, the Schilling modification, and the Bonsdorff, in which are enumerated the number of nuclei in 100 polymorphonuclear neutrophiles. The rapidity of blood sedimentation, first appreciated by Hippocrates, was again studied by Fahraeus and in 1921 by Westergren. Since then it has been widely applied in tuberculosis work but its usefulness has been impaired by the multiplicity of techniques and ways of expressing results. Houghton favors the original Westergren method. The Bonsdorff count is a reliable index of toxaemia. On the other hand the differential count reflects changes occurring in the diseased areas. Houghton attempts to balance assets and liabilities in a formula, as follows: V.B. — (S.R. + (P + M — 2L) = Index. Eosinophiles are added to the lymphocytes. The index ranges from 0 in the worst cases to 300 in the best, any figure over 260 being considered normal. The exhibition of a good blood picture is no guarantee against relapse. But when with a small early lesion the blood picture shows all around deterioration the prognosis is grave. A follow-up of 107 patients discharged showed that of those with an index above 180 on discharge, 84 per cent are working; between 120 and 180, 24 per cent are working and 63 per cent are unfit; below 120, 36 per cent are unfit and 60 per cent are dead. Acute exacerbations of any kind unduly depress the picture. Ordinary routine treatment does not usually bring about great improvement in the picture. Successful artificial pneumothorax, however, may bring restoration to normal within two or three months. Those beginning with a very poor toxic picture are especially prone to relapse and intervention may well be delayed until some improvement has occurred. The same observations apply even more to thoracoplasty. Patients in whom bronchitis exists are notoriously unsatisfactory subjects for collapse therapy, tending to develop dyspnoea, loss of weight, and constitutional disturbance. Such patients usually carry a chronic fibroid type of disease. They have deficient aeration, show a rapid sedimentation rate but a good Bonsdorff count. Lymphocyte-monocyte ratio is normal. Rapid sedimentation therefore is often due to remote effects of the disease. Ineffective collapse of the lung is betrayed by failure of the Bonsdorff count to revert to normal. As for sanocrysin, it may benefit those with a reasonably good blood picture but those with a toxic picture are likely to be made worse. —*Blood Examinations in the Prognosis and Treatment of Pulmonary Tuberculosis, L. E. Houghton, Brit. Med. Jour., December 19, 1936, no. 3963, 1246.*—(*A. P.*)

Leukomoid Response in Tuberculin-Sensitive Rabbits.—"Leukomoid" describes a blood picture similar to that of leukaemia. Tuberculosis, in a few human beings, has stimulated this response. In an attempt to produce it experimentally, two groups of adult rabbits were used. The nine controls were found to have an average normal leucocyte count of 11,000. When each received subcutaneously 10 mgm. of tuberculin per kg. of body weight, there was no appreciable change. The other group of 11 rabbits received equal amounts of tubercle bacilli (9 received the bovine strain, subcutaneously; 1 avian and 1 human, intravenously). Blood counts during the following month showed 9,900 to 48,200 leucocytes. On the 33rd day this group received the above mentioned amount of tuberculin, and daily blood examinations (May-Grünwald-Giemsa technique) were made until the rabbits were killed on the 39th day. Within 24 to 72 hours there was a marked leucocytosis (up to 110,000 and 124,000) which consisted mainly of polymorphonuclear (pseudoeosinophils, true eosinophils and basophils) cells with a marked shift to the left. Leucoblasts, promyelocytes, myelocytes, and metamyelocytes were present in the peripheral blood. The monocytes were slightly increased, and the lymphocytes definitely decreased. Necropsy revealed one rabbit (bovine) to be entirely free of tuberculosis. The other 10 had the following distribution of lesions: 8 (bovine) subcutis at side of bacterial injection: 3 (bovine), kidney; 2 (human and bovine), lungs; and 4 (bovine, human and avian), bone marrow. All the lesions were progressive and had a central area of caseation in which tubercle bacilli could be demonstrated, but in most cases the lesions were not a threat to the life of the rabbit. Dominici preparations of the bone marrow showed marked hyperplasia, the early myeloid cells replacing the fat and obliterating the sinusoids. The leukomoid response is, therefore, demonstrated in the bone marrow and the peripheral blood picture of these rabbits. The possible explanation of this response in tuberculous human beings is that the myeloid tissues become sensitized to tuberculoproteins, and, then during some obscure phase of the disease, are suddenly subjected to an overwhelming dose of it, causing excessive stimulation of the myeloid elements.—*Leukomoid Response of Tuberculous Rabbits to Administration of Tuberculin, W. H. Feldman & J. Stasney, Amer. Jour. Med. Sc., January, 1937, cxciii, 28.*—(*E. M. J.*)

Relationship of Lymphocytes and Monocytes.—There is still no agreement as to the relationship of lymphocytes to monocytes and fibroblasts. Some workers have described the transformation of small lymphocytes to large lymphocytes which give rise to monocytes. From these in turn the fibroblasts arise. In the present article a study of the conditions under which the lymphocytes are thought to undergo this change is reported. Experiments were made with the aid of tissue cultures and examinations of material presumably containing lymphocytes alone, namely, lymph from the thoracic duct. In the two series of cultures, lymph of the thoracic duct was obtained from normal dogs, and from normal and tuberculous rabbits; also from one rabbit which had been given injections of B. monocytogenes three weeks before. The following conclusions are reported. The lymph of the thoracic duct of the rabbit contains medium-sized and large lymphocytes in large numbers (from 5 to 13 per cent) and an occasional monocyte (from 0.1 to 2.3 per cent, averaging 0.45 per cent), the remaining cells being small lymphocytes. The number of monocytes in the lymph of the thoracic duct is not conspicuously increased in tuberculous rabbits, even though there are from 9 to 22.5 per cent monocytes in the circulating blood. The small lymphocytes of the lymph of the thoracic duct exhibit amoeboid motion when incubated in tissue cultures in vitro, and some remain alive for from two to six days, but most of them die within forty-eight hours. The large lymphocytes divide by mitosis into smaller lymphocytes during the first thirty-one hours of incubation. The greater number of divisions occur after from three to five hours of incubation. Monocytes present in the lymph become actively phagocytic, and after forty-eight hours these macrophages assume the characteristics of epithelioid cells. Evidence is wanting that in tissue cultures lymphocytes are transformed into monocytes and monocytes into fibroblasts. Tissue culture studies support the view that these cells represent independent cell types. —*Cultural Studies on the Relationship of Lymphocytes to Monocytes and Fibroblasts, J. W. Hall & J. Furth, Arch. Path., January, 1938, xxv, 46.*—(*J. S. W.*)

Factors Affecting Erythrocyte Sedimentation Test.—The Westergren method was used in this study at the Royal Free Hospital, London. As determined on a number of normal medical students, there was considerable individual variation. The fall was always greatest in the first hour. The rate was found increased by exercise, doubled in a few cases during the first hour, and the increase often persisted for some time. There was decreased sedimentation during digestion, the maximum occurring one to one and a half hours after taking food. Unless daily records were taken at precisely the same time and under the same conditions great variations were found. The rate was found increased by approaching menstruation, being highest one to two days before the onset. A number of graphs accompany this paper.—*A Study of Certain Factors Affecting the Sedimentation Test, M. F. Lockett, Brit. Jour. Tuberc., January, 1937, xxxi, 31.*—(*A. P.*)

Gastric and Salivary Juice in Pulmonary Tuberculosis.—The author reports the results of examinations of the gastric function in twenty-one cases of pulmonary tuberculosis where he used fractional stomach washings to secure the gastric juice, and at the same time he measured the amount of the sputum excreted during the gastric lavage. The sputum was further explored as to the determination of the concentration of chloride and rhodan and as to the presence of diastatic ferments. The results show a reduction of acidity of both free and total hydrochloric acid and sometimes a total achylia. No case showed hyperchlorhydria or hypersecretion. The acidity curves showed considerable variation from the normal and presented types of monotonous curves of total achylia, of late acidity, and also curves of gradually ascending type. Total achylia occurred in those cases where there was no response to the ingestion of histamin and this was only seen in long standing disease. There was no definite relationship between the forms and stages of the tuberculosis and the degree of acidity and the type of the curves. The author assumes that the finding of excretional variations were probably consistent with functional and morphological lesions of the gastric mucosa. Whether the gastritis may be considered as due to a tuberculotoxic damage of the mucosa,—the haematogenous gastritis of Faber, and the infectious-toxic gastritis of Boas, or rather due to a local irritation of the mucosa by sputum which had been swallowed, such as in the irritative gastritis of Marfan, cannot be determined definitely. Besides these anatomical causes of dyspepsia in the tuberculous patient a lability of nervous-functional origin such as central-psychic and vegetative-nervous hyperirritability should be suspected. There was further a marked reduction of the amount of the saliva, the degree of which was found to be consistent with the gastric disturbance. While the excretion of chlor-

ide failed to show any definite deviation from the normal there was a marked decrease in the excretion of rhodan. This reduction probably represents a selective lesion of the salivary glands which may be caused by tuberculotoxic agents. There was also an increase of the excretion of amylolytic ferments which until the present time has not been explained.—*Untersuchungen über die Sekretion der Magen-und Speicheldrüsen bei der Lungentuberkulose, G. Fabian, Beitr. Klin. Tuberk., February 18, 1937, lxxxix, 135.*—(*F. G. K.*)

Congo-red Test in Amyloidosis.—The reliability of the Congo-red test for amyloidosis was determined by the correlation of the percentage of absorption of the dye with the presence or absence of amyloid in a series of seventy-three necropsies in tuberculous patients. In the twenty patients in whom amyloid was found, the absorption of Congo-red was from 90 to 100 per cent with one exception in which 35 per cent was recorded. In the absence of amyloid the absorption of the dye ranged from 10 to 75 per cent.—*An Evaluation of the Congo Red Test for Amyloidosis, S. Lipstein & O. Auerbach, Quart. Bull. Sea View Hosp., January, 1937, ii, 120.*—(*A. A. E.*)

Monocytogenes Infection and Origin of Monocytes.—The isolation of *Bacterium monocytogenes* promised to be a great aid in determining the origin of the monocytes of the blood, for when appropriate doses of a culture of this bacterium are injected into rabbits, monocytosis ensues in the bloodstream with great regularity. In view of this, it would seem that a careful histological analysis of the blood producing organs of these rabbits would disclose the site of origin and the cells from which the monocytes develop. This is not the case, however, for the several investigators who have used this bacterium to study the precursor of the monocyte fail to agree as to the origin of this cell. All these investigators failed to examine the tissues of their infected animals before the number of monocytes in the circulating blood had increased and the author believes that the diverging and at times diametrically opposed results reported are largely due to this fact. She avoids this error by making histological examinations as early as one hour after the injection of the infecting dose of *Bacterium monocytogenes*. This report covers only the changes in the peripheral blood, the mesenteric and cervical lymph nodes and the spleens of rabbits and guinea pigs infected with a single standardized dose of the *Bacterium monocytogenes*. Materials, methods and findings are discussed in detail and the author concludes that the monocytes which are present in great numbers in infection with *Bacterium monocytogenes* arise from lymphocytes. She bases her conclusions on the following points: (*1*) The initial response to the injection of *Bacterium monocytogenes* in both the rabbit and the guinea pig is a mobilization of the lymphocytes present in the lymphatic tissue, followed by an intensive new formation of lymphocytes. (*2*) During the height of this initial hyperplasia, which precedes the peak of the monocytosis in the peripheral blood, all stages of transition between lymphocytes and monocytes are found throughout the diffuse and nodular lymphatic tissue of both the mesenteric lymph node and the spleen. (*3*) There is complete absence of any evidence of cells other than lymphocytes transforming into monocytes. In brief, the free stem cell from which the monocyte develops in the diffuse lymphatic tissue and lymphatic nodules of the mesenteric lymph nodes and in the spleen is morphologically identical with the lymphocytes in these tissues.—*Reaction of Lymphatic Tissue in Early Stages of Bacterium Monocytogenes Infection, E. A. Conway, Arch. Path., February, 1938, xxv, 200.*—(*J. S. W.*)

Pulsations of Chest-Wall—Pulsations of the wall of the chest are studied simply and effectively by careful inspection and palpation. The latter is performed with the hand slightly dorsiflexed, the base of the metacarpal bones being placed with slight pressure against the area under observation. Comparison with the radial pulse is satisfactory for determining the phase to which the pulsatory movement belongs. The pulsatory phenomena are of considerable duration. Therefore the fact that the radial pulse is delayed does not cause confusion. Graphic registrations have confirmed this. Pulsatory phenomena usually produce diffuse movements of the ribs and soft tissues. For this reason it is advisable to make the receptor used for graphic registrations of sufficient diameter to cover one intercostal space and the two adjacent ribs. During systole the heart becomes hard and tense, and its curvature is increased. This latter is accomplished by an increase in the anteroposterior diameter and a decrease in the transverse. Also the heart revolves on its transverse axis, and the apex is raised and pushed against the anterior wall of the chest. Simultaneously the volume of the heart diminishes. The ventricular cone is shortened, the auriculoventricular septum approaches the apex, and there is a centripetal marginal change. The changes in shape and volume

of the heart are primarily responsible for pulsations of the wall of the chest. The change in shape is essentially centrifugal and tends to push the wall outward. The change in volume tends to draw the wall inward. Normally that portion of the thorax overlying the right ventricle does not pulsate, for the systolic forces are equal. It is not uncommon, however, to observe a slight systolic depression in this region when the aspiratory force of systole predominates. This is especially true in young people. With mitral stenosis and enlargement of the right ventricle, the heart is flattened against the chest-wall. During systole the anteroposterior diameter of the heart increases. This results in a bulging. Dilatation of the left auricle is an additional factor in producing this effect because it tends to press the heart against the chest-wall. Systolic depressions if diffuse, extending over several intercostal areas and affecting both ribs and soft tissues, are important. Such depressions are produced chiefly by the centripetal forces associated with diminution in the volume of the heart. These are encountered more frequently in the absence of pericardial adhesions than in their presence. In so far as the heart touches the wall of the chest any decrease in volume of the heart will exert a direct aspiratory effect. A depression will result unless another tissue, usually the lungs, takes up the space quickly. Systolic depressions are especially likely to occur when there are adhesions between the heart and the thoracic wall, with obliteration of the costomediastinal pleural sinus, or when the adjacent lung has been compressed by an enlarged heart The fall of intrathoracic pressure with a rapid outflow of blood during systole is an important factor acting indirectly to produce an aspiratory effect. This is the factor which may occasionally produce a systolic depression in normal individuals. An especially marked aspiratory effect occurs when the stroke volume of one ventricle, and the volume of blood leaving the thoracic cavity are increased as in tricuspid and aortic regurgitation. The more abrupt the outflow of blood from the thorax and the decrease in heart volume, the less effectively will the inflow of venous blood into the thorax be able to keep pace with it. It must be kept in mind that the aspiratory effect is in varying degrees compensated by the centrifugal force of the systolic changes in heart shape. In three conditions, adhesive pericarditis, aortic regurgitation, and tricuspid regurgitation, the aspiratory effect is augmented. The anterior portion of the chest-wall is affected because it is next to the heart and because it is more flexible. The effect of direct aspiration is localized to the precordium, and is most marked in the left midclavicular line. It is scarcely perceptible in the sternal area. The effect of indirect aspiration is more diffuse and exceptionally may include the dorsal portion of the left side of the chest (Broadbent's sign). Between the sixth rib and the costal margin the liver is separated from the chest-wall only by the diaphragm and the costopherenic sinus. Pulsations of the liver which may be perceived even in normal subjects are largely determined by three factors. The first is the movement of the column of venous blood which causes variations in the size of the liver corresponding to phases of the cardiac cycle. Secondly the movements of the heart are transmitted to the surface of the left lobe of the liver via the diaphragm. Thirdly there is a systolic aspiration produced by direct action on the diaphragmatic surface of the liver, and by the movements of the column of venous blood. It is important to distinguish volumetric changes in the organ from movements of the liver as a whole. Palpation of the right costal arch in a normal subject will enable one to observe a cephalad movement of the hand which corresponds to a systolic depression of the caudal surface of the liver. A systolic depression can also be observed if the hand is held over the right wall of the chest in the hepatic area. These findings can be readily interpreted by assuming that there is a systolic diminution in the size of the liver due to aspiration of venous blood into the chest. X-ray studies demonstrate that there is no cephalad movement of the liver during systole excepting along the left leaf of the diaphragm. There is a slow presystolic cephalad movement of the right side followed by a rapid and marked caudal movement during systole. To produce such a depression in the hepatogram it is essential that there be a satisfactory diastolic emptying of the right auricle, followed by a forceful ventricular contraction pulling down the auriculoventricular septum, thereby increasing suddenly the volume of the auricle. A third important factor is the outflow of blood from the thorax with the resulting decrease in intrathoracic pressure. The systolic depression is more marked when the stroke volume increases as in cases with aortic regurgitation. Failure of the right ventricle tends to counteract this and may even reverse the picture. Auricular fibrillation also tends to decrease the systolic hepatic depression. This is because the major influx of blood into the right auricle is during diastole and in cases with marked congestion only during early diastole. The result is an ascending hepatic pulse during systole with a steep descent at the beginning

of diastole. The latter is readily palpable. With tricuspid regurgitation there is a definite systolic elevation and a less definite diastolic depression; there may even be a shift of the wall of the chest from left to right. With tricuspid stenosis there may appear a presystolic lift in the hepatic area manifested as a slight presystolic elevation on the surface of the liver and on the chest-wall as far as it covers the liver. There may occur two pulses if there is an associated-tricuspid regurgitation. Secondary pulsations or associated pulsations of the chest-wall are determined by the force of the primary impact, the direction and localization of the impact and the elasticity and flexibility of the bony thoracic wall. Propulsion of the midportion of the anterior thoracic wall causes a flattening of the lateral ribs. This is well seen with hypertrophy and dilatation of the right ventricle in mitral stenosis in which instance it is usually more marked on the right. If the force acts on one side there is a shift of the chest-wall forward and to that side. If the force is directed inward as with pericardial adhesions there is a shift of the chest to the opposite side and a forward movement on that side.—*Pulsations of the Wall of the Chest, W. Dressler, parts I, II, III, IV, & V, Arch. Int. Med., August, September, October, 1937, lx, 225, 437, 441, 654, 663.*—(*C. L. D.*)

Right Middle Lobe and Lateral Roentgenogram.—Lateral films may bring out shadows which are not definite in the ordinary posteroanterior or stereoscopic films and are usually, but not always, superior to films taken in extreme lordosis. Anatomically, the lateral border of the middle lobe is triangular in shape and the medial border rectangular. These different shapes are often shown in the lateral films. Empyema limited to the interlobar fissure rarely occurs except in association with pulmonary abscess and the spindle-shaped shadow said to be diagnostic of such a process is rarely traced to this cause. Overlap of a high right diaphragm and the posterior border of the heart gives a shadow often mistaken for the spindle-shaped shadow of interlobar effusion. Primary tumors of the liver situated below the diaphragm must be considered in the interpretation of the lateral roentgenogram. Varying degrees of atelectasis of the middle lobe are well shown in the lateral film and have in the past been misinterpreted as due to interlobar thickening. Bronchiectasis, tuberculosis, carcinoma, abscess, lobar pneumonia, infarct, fibrosis, and emphysema have been shown to be limited to the middle lobe.—*The Right Middle Lobe and the Lateral Roentgenogram, D. S. King, Jour. Thoracic Surg., August, 1937, vi, 666.*—(*L. F. B.*)

Tomography and Other Roentgenological Advances.—Pulmonary tomography has been introduced into roentgenographic practice since 1932, has been extensively used on the Continent, especially in Germany, and marks a definite advance in methods of investigation. Camino, of Cambo-les-Bains, pointed out that tomography makes possible the photographic representation of a layer of the tissues in any desired plane, its thickness regulated from 5 to 20 mm. and its elements visually represented to the exclusion of those located in front or behind. This method can show the exact limits and shape of cavities where the usual methods fail, also can localize projectiles and pleuropulmonary adhesions in artificial pneumothorax. W. Schmidt, of Heidelberg, adduced striking evidence of the value of this method in providing additional help in the choice of cases for thoracic surgery and other operative procedures. It can reveal cavities ordinarily obscured by thickened pleura, wax, oleothorax, effusions, etc., and is of great use after operation in following the persistence or disappearance of cavities. Vallebona, of Genoa, prefers stratigraphic methods in which the tube does not move, and considers the method most useful also in fibrocavernous lesions, bronchiectasis, cystic lung disease and in conjunction with lipiodol. Radiokymography is an optical registration of the movements of the deep organs permitting a study of the fine modifications of respiration. Delhern (Paris) and Bonte (Lille) have carried out detailed studies, also Thoyer-Rozat and Bernard (Paris) and H. Weber (Berne). Weber shows that the largest respiratory excursions are made by the third, fourth and fifth ribs and that with a nonadherent interlobar fissure it is impossible to rest the upper lobe by phrenic nerve operation. *Some Special Methods and Apparatus in Pulmonary Roentgenography:* Oppert, of Paris, discussing the utility of fluoroscopy in routine medical examinations, believes that the improvement in modern screens gives it a diagnostic value in both pulmonary and cardiovascular thoracic lesions which is quite important. Stéphani, of Montana, Switzerland, uses high speed, high kilovoltage (130 effective) and high milliamperage (150) exposures of heart and lungs at 2 metres distance. He describes the characteristics of early cavities, with their *anneau d'avancement* which represents a shell of atelectatic and caseating tissue. This narrows as the cavity diminishes but persists until complete cicatrization. Punched out cavities without

surrounding reaction fail to show a tendency to heal. As to apparatus, Bouwers, of Eindhoven, Holland, states that he finds, for instantaneous roentgenography, transformers less logical generators than condensers, which accumulate energy. Franke, of Berlin, believes the most perfect roentgenographs of the lungs obtainable by the use of the Bucky diaphragm and the best technical progress realized in the "Explorator" of Albrecht-Siemens, a fine-grid, well focused, automatically set diaphragm. Many roentgenographic and tomographic reproductions accompany this paper.—*Recent Advances in Pulmonary Radiography with Special Reference to Tomography—An International Discussion, H. Roche, Tubercle, June, 1937, xviii, 385.*—(*A. P.*)

Circular Lesion of Pulmonary Tuberculosis.—Circular lesions usually appear as single foci, though they may be multiple or associated with other foci, and often resemble neoplastic metastases. Assman was the first to call attention to this type of lesion and believed them to be tuberculous in nature but not primary foci. Albert was of the opinion that they were encapsulated tuberculous lesions. Straub, after observing eight cases, felt that they were of no prognostic value but were due to encapsulation of a previous exudative flare-up and were apt to form cavities if the lesions were in communication with bronchi. A five year study is presented which was made to ascertain the progress of circular lesions and to try and determine an effective method of treatment. Sixty cases are reported; all had circular lesions which appeared to be tuberculous in nature. The majority were observed for over a year. Some developed from previous filtrations and others were circular when first seen. Three types are considered. The first group includes those lesions developing from diffuse infiltration. They are unstable, some undergoing excavation, but the majority tend to become smaller. Usually they are not important in the spreading disease but may change as changes appear in other foci. Being incompletely healed these lesions require more careful observation than those in the other groups. Most of the 16 cases of this type that were observed showed retrogression. However, phrenic surgery was often employed as a precautionary measure; a few required pneumothorax but none came to thoracoplasty. Group II is comprised of those lesions which are circular when first seen. They are usually single but may be multiple and vary in size from 0.5 cm. to 3.0 cm. They appear uniform in density, are sharply outlined and definitely in the parenchyma and tend to remain stationary for a long time. This is the type that is least apt to become active. Such lesions require only periodic check-up and appropriate treatment when there is progression. In the group studied, 36 remained inactive, three after a long period of time underwent excavation but following this the lesion completely disappeared. The lesions included in group III are a receding stage of childhood tuberculosis, first appearing circular and then becoming smaller without the aid of collapse therapy. They should be watched for a long time. It is concluded that these lesions represent a type of healing in which fibrous encapsulation is the predominant process, that they may develop from first infection, that they are of little value as to prognosis, but are a relatively benign type of tuberculosis.—*The Circular Lesion of Pulmonary Tuberculosis, C. C. Birkelo & J. A. Kasper, Radiology, February, 1937, xxviii, 157.*—(*G. F. M.*)

Tomography in Pulmonary Tuberculosis.—Tomography is a valuable new method for the determination of cavitations, for an improved visualization of the healthy side in cases where surgical procedures are planned, and for the localization of adhesions in artificial pneumothorax with partial collapse of the lung. In the latter cases the method helps to bring out more clearly the adhesional attachments and the extent of marginal cavitations. On the other hand, the author emphasizes the value of multiple routine exposures, such as films taken in the recumbent position, special films of the apices and stereoscopic examinations. Tomography is not of material value in respect to fine or medium lesions of granular type while coarse pulmonary lesions can be demonstrated. The author calls attention to the necessity of limiting the use of tomographic procedures basing his conclusions on two hundred examinations.—*Die Rolle des Roentgenschichtverfahrens bei der Lungentuberkulose, H. Schulte-Tigges, Fortschr. a. d. Geb. d. Roentgenstr., August, 1937, lvi, 316.*—(*F. G. K.*)

Pulmonary Tuberculosis and Sputum Examination.—It is doubtful if a pulmonary lesion with persistent negative results in all avenues of investigation can be really regarded as tuberculous. Sputum-negative cases with doubtful radiological evidence should not be notified but kept under observation. Higher standards and conditions for notification and conclusive evidence before its acceptance are demanded. Responsible authorities should consider providing better pathological laboratory facilities or assistance. Every case of pleural effusion

should have fluid removed and examined cytologically, bacteriologically and biologically. The establishment of preventoria for doubtful or negative cases is advocated. The elimination of the nontuberculous disease group should be the first consideration. They should be correctly treated. The diagnosis of juvenile tuberculosis is extremely difficult and requires even more careful investigation and confirmation than tuberculosis in adults. Every chest case sent for X-ray should be accompanied by complete clinical data.—*Negative Sputum and Pulmonary Tuberculosis, G. I. Davies, Tubercle, August, 1937, xviii, 481.*—(*A. P.*)

Gastric Lavage in Roentgen Negative Cases.—Of 271 cases whose X-ray examination failed to reveal any tuberculous foci 12 per cent contained tubercle bacilli in the gastric lavage. This method of examination is thus of definite value not only in children but also in adults. The number of bacilli demonstrated by culture in the gastric contents is of importance epidemiologically. None of these cases had any laryngeal lesions. In a series of 23 control cases no tubercle bacilli were found in the stomach contents.—*On the Diagnostic Value of Gastric Lavage in Adult Patients without Roentgenographic Foci in the Lungs, Ulf Gad, Acta tuberc. Scandinav., 1937, xi, 188.*—(*M. B. L.*)

Sputum Examination.—The examination of the sputum remains of inestimable value in the diagnosis and treatment of pulmonary tuberculosis; but the importance of the presence or absence of tubercle bacilli in the sputum must be determined by a study of the patient's symptoms and signs and the appearance of the X-rays. The sputum may be classified as persistently positive, persistently negative or intermittently positive and negative. A consistently positive sputum can only be produced by an actively caseating lesion somewhere in the bronchopulmonary system. In the absence of demonstrable pulmonary lesions ulceration in the trachea or bronchi may be found on bronchoscopic examination. A very large amount of sputum which contains few tubercle bacilli suggests a coëxistent bronchiectasis, bronchorrhoea, lung abscess, or carcinoma. A consistently negative sputum in a patient who is known to have tuberculosis is a sign that the activity of the lesion is arrested. Repeated examination of concentrates of the sputum and gastric washings is essential. Interpretation of the importance of sputum which is very rarely positive is much more difficult; in these cases the nature of the disease process is of the utmost importance. Occasionally positive sputum is of much less importance in a chronic productive type of case than in a caseous pneumonic type.—*A Clinical Interpretation of the Sputum Examination, E. R. Levine, Quart. Bull. Sea View Hosp., October, 1937, iii, 46.*—(*A. A. E.*)

Demonstration of Tubercle Bacilli by Catheterization of Bronchi.—In doubtful cases where ordinary procedures fail to give decisive information and in cases where it is desired to know the exact locality of the open tuberculous lesions, the authors recommend the use of the catheter. Under light local anaesthesia the catheter is introduced into the nares. By proper manipulation and with the aid of the fluoroscope the catheter can be introduced into the desired lobe. A certain amount of sterile serum is then introduced into the catheter and again withdrawn by means of a syringe. This material is then examined for tubercle bacilli by the usual cultural and inoculation methods. —*Recherche du bacille de Koch par le prélèvement direct: Cathétérisme bronchique et division des crachats, M. Leon-Kindberg, G. Lapiné & P. Adida, Rev. d. l. tuberc., April, 1937, iii, 467.*—(*M. B. L.*)

Demonstration of Tubercle Bacilli.—Seventy fluids of various kinds from tuberculous patients were studied for the presence of the bacillus of Koch. Pleural fluids, purulent materials, urine, cerebrospinal fluid and serofibrinous pleural fluids were examined microscopically, by culture on Löwenstein's and Petragnani's media and by guinea-pig inoculation. In each of the cases which were microscopically negative the method of passage by inoculation in series was employed. Results showed that with purulent pleural fluids and with cerebrospinal fluids, inoculations gave a greater number of positive results than did cultures, while with serofibrinous pleural fluids the inoculation method and the cultural method gave about the same results. On the whole the method of inoculation gave the greatest number of positive results. Cultures on Löwenstein's medium yielded a greater number of positive results than did cultures on Petragnani's medium, but in certain cases negative by other methods the only positive finding was obtained in cultures on Petragnani's medium. The method of passage inoculation augmented the number of positive findings over the single inoculation method.—*Valeur comparée des méthodes de recherche du bacille de Koch dans les liquides de ponction, A.-R. Arena & P.-J. Ibarra, Compt. rend. Soc. biol., February 6, 1937, cxxiv, 498.*—(*M. T. W.*)

Tubercle Bacilli in Gastric Washings.—Present methods have made the early diagnosis of pulmonary tuberculosis possible,

but this has given rise to the problem of determining the status of the lesion as soon as possible. Such persons usually have no complaint, the physical examination reveals nothing pertinent and the temperature and pulse may be normal yet the lesion may be active. Previously, serial roentgenograms were made which often meant loss of time when the lesion was active and required treatment or unnecessary inactivity or hospitalization when the lesion was quiescent. Some help is obtained from laboratory studies such as the sedimentation rate, repeated total white and differential counts and examination of the fasting gastric contents which may indicate the course of the disease before changes in the roentgenogram may be seen. This paper deals with the importance of the examination of the gastric contents. All University of Wisconsin students showing parenchymal infiltration are requested to enter the Infirmary for a three day period of observation and study. During this time the temperature and pulse are recorded every four hours, the sedimentation rate is determined, the total white and differential counts are made and the fasting gastric contents are aspirated on three successive mornings. If necessary the stomach is washed out with normal saline. The specimen obtained is examined by direct smear, culture and guinea-pig inoculation. Thirty cases thus studied are reported, all of whom showed some X-ray changes subsequent to animal inoculation indicating some degree of activity. Of these, three, or 10 per cent, had a positive sputum while the gastric contents were positive in 36.7 per cent on direct smear, in 31 per cent on culture and in 80 per cent by guinea-pig inoculation. No minimal case was found to have a positive sputum, but 15 (71.4 per cent) out of 21 were positive by gastric aspiration and guinea-pig inoculation. Five of the six with negative gastric aspiration showed progressive retrogression of the lesion, four continuing their university work. Three students who returned to school after months of treatment but with bacilli still present in the gastric contents experienced exacerbations of their disease. It is believed that this procedure merits more attention and that it may well be used to determine activity of the lesion and the time at which the patient may resume former activities. The absence of tubercle bacilli in the gastric contents suggests an inactive lesion or, if active, one in which the prognosis is good.—*Tubercle Bacilli in the Gastric Contents—An Important Diagnostic and Prognostic Finding, R. H. Stiehm, Amer. Jour. Med. Sc., September, 1937, cxciv, 340.*—(*G. F. M.*)

Demonstration of Tubercle Bacilli.—Cultural and biologic tests were made of the sputa of 128 patients examined in a provincial dispensary. Seventy-nine of them were new patients, while 49 had called at the dispensary either for continuation of pneumothorax treatment, or for routine check-ups, having been previously discharged from the sanatorium as apparently arrested cases. The sputum of all of them had been repeatedly negative on routine microscopical examination. Petragnani's method was used for the cultures, and two guinea pigs were inoculated with each specimen. Positive tests were obtained in 31, or 24.22 per cent, of all cases, divided as follows: (*a*) both cultures and guinea pigs positive, 22 cases; (*b*) only guinea pigs positive, 5 cases; (*c*) only cultures positive, 4 cases. Twelve of the former sanatorium patients and 19 of the new patients were positive. These results, the author believes, give sufficient evidence for the urgent need of having the dispensaries equipped and prepared to carry through all tests necessary for the accurate examination of the sputum, especially in view of the increasing number of early cases and postsanatorium patients calling at the dispensaries. —*Sull'utilita'dei metodi biologici per l'accertamento della tubercolosi pulmonare sperta nella pratica dispensariale, G. Spartaco, Giorn. di Batteriol. e Immunol., October, 1937, xix, 497.*—(*G. W. W.*)

New Tuberculin Patch Test.—A new tuberculin patch test is described. The patch consists of a strip of adhesive tape on which a square of filter patch saturated with tuberculin has been placed. Of 209 tuberculous children, 187, or 90 per cent, showed conformity between the results of the patch test and those of the Pirquet test. Of the 22, or 10 per cent, in whom results did not conform, 15 were children showing a positive reaction to the patch test and a negative reaction to the Pirquet test.—*A New Tuberculin Patch Test, H. Vollmer & E. W. Goldberger, Amer. Jour. Dis. Child., November, 1937, liv, 1019.*—(*M. B.*)

Patch Test in Patients for Gold Therapy.—This study was suggested by the frequency and complexity of complications following sanocrysin administration in tuberculous patients, as it was believed that some of these were due to hypersensitivity. The patch test, also known as the contact eczema test, recommended by Lichtenstein, appeared to be the best means available to determine this and was therefore carried out in a series of cases. This test has its principal use in occupational dermatitis, plant dermatitis, dermatitis medicamentosa and eczematous type drug eruptions such as are seen following arsphenamine and mercury

administration. In dermatitis from endogenous or exogenous sources the patch test is preferable to the scratch or intracutaneous methods. Its technique is simple: 0.3 gm. of sanocrysin is mixed intimately with 0.6 gm. pure lanolin and allowed to stand for twenty-four hours. It retains potency indefinitely, even if discolored. The area on the arm is cleansed with ether and an amount the size of a split pea is rubbed gently in with a finger cot over an area the size of a five cent piece. This is covered with sterile gauze and retained with adhesive tape. Examination is made after forty-eight hours, unless persistent itching occurs before this. The test is performed on the day of the sanocrysin injection and a positive reaction is purely local and not regarded as such unless there is definite vesiculation. The test was performed on 60 patients who had never taken sanocrysin, on 38 out of 42 patients who had completed one or two courses, and on 16 patients receiving their first course. Of those in group I, only one case showed a definite positive test. Of those in group II 10 showed definite clinical complications, all showed some albuminuria and some urinary casts. Of 38 tested, 3 of the cases with complications were positive, including 2 with a papular dermatitis and one with exfoliative dermatitis. Of the 16 in group III, all tested prior to sanocrysin, all reacted negatively. One has since developed an urticaria and one a stomatitis.—*The Value of the Patch Test in Gold Therapy, H. Schwatt & A. Rest, Tubercle, American Section, June, 1937, xviii, 400.*—(*A. P.*)

Meinicke Reaction in Tuberculosis.—The Meinicke serological reaction for tuberculosis was carried out on 700 cases, the majority of which had tuberculosis. It was found that the reaction is relatively highly specific. In the majority of instances the reaction is positive in active tuberculosis and negative in inactive cases. The reaction is also negative in rapidly progressive cases. It is assumed that this is due to saturation of antibodies by the rapidly accumulating antigen or to defective antibody production. To the extent that the concentration of antibodies in the serum is of prognostic significance, to that extent is the Meinicke reaction an indication of the prognosis of the disease. —*Ueber die diagnostische und prognostische Bedeutung der Meinicke-Tuberkulosreaktion, E. Pieck, Ztschr. f. Immunitätsforsch., May, 1937, xc, 358.*—(*M. B. L.*)

Levinson and Tryptophan Tests in Tuberculous Meningitis.—The results obtained with the Levinson and tryptophan tests of the spinal fluids of 35 patients with various types of central nervous system involvement are reported. Ten of the 35 were cases of tuberculous meningitis. The Levinson test was positive in every case of tuberculous meningitis; the tryptophan test in only 3 of the 10. The Levinson test was positive in 16 per cent of the cases with nontuberculous involvement, and the tryptophan test in 8 per cent of such cases. There appeared to be no significant relationship between positive tests and the sugar, chloride, protein content or white cell count of the spinal fluids. It is concluded that both tests have discrepancies making them unreliable diagnostic aids.—*A Comparative Study of the Levinson and Tryptophan Tests as Aids in the Diagnosis of Tuberculous Meningitis, F. X. Giustra, Jour. Ped., December, 1937, xi, 805.*—(*M. B.*)

Prognosis with Modern Treatment of Pulmonary Tuberculosis.—Twenty years ago pneumothorax was hailed as the greatest advance in therapy since the institution of sanatorium treatment and fourteen years ago the opinions in Burrell and MacNalty's report (1922) were unanimously favorable. More sober judgment now tends to limit its applicability and especially in cases of long-standing fibrotic disease. An investigation by Trail and Stockman at Midhurst (1932) indicated a definitely improved prognosis in groups I and II but did not encourage its use in group III. Even where continued treatment was possible 22 per cent of group II and 42 per cent of group III cases were dead at the end of a period averaging five years. Bentley's recent report (1936) reviewing the experience of the London County Council shows a gain of about 20 per cent alive compared with a more conservatively treated group, and a report from Frimley and another series from Midhurst (Trail, 1934) give a comparable advantage. However, it is found that fully 60 per cent of cases are already bilateral at the time of induction, and Bentley shows that even slight contralateral disease materially reduces the chances of survival. Thoracoplasty has suffered in the past from over optimism. However, the combined figures of Archibald, Bull, Gravesen, and German workers give 42.3 per cent able to work without evidence of disease for at least a year, and Gravesen, in Denmark, obtained about double the percentage of sputum-negative cases compared with a group on routine sanatorium care. It would seem that in the past too much time has been wasted in routine sanatorium treatment or persistence in an ineffective pneumothorax. The prognostic significance of erthrocyte sedimentation is discussed. The monocyte-lymphocyte ratio and the

von Bonsdorff count have also been widely applied in tuberculosis cases. Houghton combines the sedimentation rate, the von Bonsdorff and differential white blood cell counts, into a single index or haemogram. Its improvement or the reverse under treatment yield valuable indications. The year immediately following discharge from a sanatorium is the most critical. Not the least of advantages to the patient with artificial pneumothorax is the continuous and expert supervision automatically received for some three years following induction, with frequent fluoroscopic and X-ray examination. In general, patients not receiving active treatment get insufficient after-care. It is a minority of cases that are diagnosed in the early stages and the proportion has not increased since 1921. The proper treatment of cases of pleurisy with effusion needs emphasis, also the incidence of latent lesions in the apparently healthy.—*Recent Aids to the Prognosis of Pulmonary Tuberculosis, R. R. Trail, Lancet, January 30, 1937, ccxxxii, 247.*—(*A. P.*)

Renal Tuberculosis.—The early diagnosis of renal tuberculosis, as in pulmonary tuberculosis, depends on planned case-finding methods, for early renal tuberculosis may present no symptoms and but meagre signs. It is felt that to wait until symptoms of genitourinary disease appear, is to wait until the renal lesions are so far advanced as very likely not to be amenable to therapy. Every patient with tuberculosis, particularly of bone, joint or intestines, should be examined for renal infection before urinary symptoms are present. The most important examination is that of the urine for the presence of tubercle bacilli, and this must be repeated at intervals, because infected kidneys will transmit bacilli and cellular elements to the urine at one time and not at others. The routine procedure at the Glen Lake Sanatorium is as follows: All patients have routine studies of the urine every three months no matter where their tuberculous lesion may be or its extent. If cellular elements are found in the sediment, the sediment is stained by Ziehl-Neelsen method. If no acid-fast rods are found, four weekly collections of urine, two of which are 24-hour specimens, are centrifuged, and the sediment is injected once each week into the peritoneal cavity of the same guinea pig. If cultural methods are available, these may be used in conjunction or alone. Experienced workers obtain as good or better results with cultural methods as with guinea pigs, and the expense is less. In five years, the bacteriologists of the Minnesota Department of Health found only one instance in which organisms isolated in cultures were nonvirulent for guinea pigs. In addition, every patient with tuberculosis in any form who shows cellular elements in the urine has a complete urological examination whether or not tubercle bacilli are found. Functional tests are done first, not primarily for diagnostic purposes but to determine whether the patient can tolerate retrograde pyelograms. Flat plates are taken for the presence of calcifications or psoas abscesses. Cystoscopy is then done with a reflux test—overdistending the bladder with a solution of methylene-blue after the ureteral catheters are in place, and watching for evidence of return of the methylene-blue. Such refluxes occur in 14 per cent of cystoscopies. If the reflux test is negative, indigo-carmine is given intravenously. Minor differences in function do not necessarily indicate renal damage, and conversely large areas of parenchymal destruction are not inconsistent with normal function. Then, 10–20 cc. of urine are collected from each kidney, each divided into two portions and injected into two guinea pigs. One pig is sacrificed, if it does not die, at the end of six weeks. If it is negative, the companion pig is allowed to live a second six weeks' period. Bilateral pyelography is then carried out. Hundreds of such tests have been carried out in the presence of renal tuberculosis without untoward sequelae. The ureteral catheters are inserted so that their eyes are in the kidney pelvis and not in separate calices or in the ureters. After the X-rays are taken, the radiopaque solutions are aspirated. The lesions that may be demonstrated in this way are (*1*) ulcerative lesions, the least destructive type, appearing as small irregularities or moth-eaten areas in the border of a calyx that projects slightly, if any, into the parenchyma; (*2*) parenchymal abscesses, recognized as definite filling defects, projecting from the border of a calyx into the parenchyma; and (*3*) tuberculous pyonephrosis, consisting of multiple, extensive, parenchymal abscesses associated with widespread tuberculosis of the kidney pelvis. Repeated bilateral pyelograms are necessary to follow the course of these lesions and so estimate the patients capacity of resistance, healing, or the rate of progression, and to demonstrate the constancy of slight defects. The ulcerative lesions are usually associated with pus cells and bacilli in the urine, while the parenchymal abscesses may not, depending on the local reactions incident to walling off or healing. The rate of progression of these lesions may be very slow, and the surgical treatment is rarely an emergency measure. It should aim at the patient as a whole, remembering that renal tuberculosis

is a local manifestation of a constitutional disease, and plenty of time may be taken to evaluate all factors. Nondestructive renal tuberculosis, unilateral or bilateral, is a nonsurgical condition and should be treated by medical methods. In early lesions, surgical conservatism should rule unless the pyelogram reveals definite evidence of erosion and the urine from the second kidney is repeatedly negative for bacilli. Unilateral slightly destructive tuberculosis should be treated conservatively under careful observation. If the disease is progressive, or extensive unilateral destructive lesions are present, surgery is indicated. Bilateral destructive renal tuberculosis is not a surgical condition except to stop haemorrhage or to relieve pain and sepsis, the result of an obstructed ureter. If a perinephritic abscess should develop, immediate surgical drainage is indicated. Nephrectomy should not be attempted since then it is a procedure attended by considerable extra risk. Study of autopsy data and clinical experience have demonstrated that the first consideration in treatment is the estimation of the general condition and the patients ability to control lesions of tuberculosis. This defense against the bacillus must be manifested before any surgical treatment is recommended, since, not being able to extirpate all of the individual's tuberculosis, surgical treatment of the renal infection is not a cure but an aid in obtaining a good clinical result.—*The Diagnosis and Indications for Treatment of Renal Tuberculosis, Amer. Jour. Surg., October, 1937, new series, xxxviii, 57.*—(*A. E. M.*)

Genitourinary Tuberculosis.—These lesions are always secondary to disease elsewhere, usually either pulmonary or skeletal. Harris in 1928–1929 found 25 per cent of 110 cases of bone tuberculosis showed tubercle bacilluria. However, the genitourinary disease may be part of a generalized miliary tuberculosis (tubercle bacillaemia). Renal tuberculosis is generally unilateral but the second kidney often becomes infected through the blood-stream, the periureteral lymphatics, or by retrograde extension from the bladder. In the caseous form the perinephric fat is usually eventually infected. Rarely fibrosis and contraction occur. The ureter, in serious cases, becomes converted into a rigid thick walled tube, with large areas of mucosa destroyed. The bladder is always secondarily invaded from adjoining organs, gray tubercles around the ureteral orifices giving way to rigid (golf hole type) orifices, with later trigonitis and ulceration. In the epididymis the disease begins in the globus major or minor, usually unilateral and spreading from the prostate, but it may be haematogenous. The disease may be limited to a nodule or the whole organ become a caseous mass. An initial hydrocele, or rarely haematocele, is common. Suppuration often occurs, involving testes and scrotum with sinus formation and secondary invasion. The vas deferens becomes infected either from the prostate and vesicles or the epididymis. The prostate is invaded from the epididymis, the blood-stream or the bladder. The lesion is usually caseous but may be sclerotic. In favorable cases calcification occurs. Abscess formation is common with sinuses leading to the rectum, perineum, bowel or bladder. In the external female genitalia the disease may be ulcerative or hypertrophic, or mixed. Bartholin's glands are occasionally the sole discoverable site of the lesion. The vagina and cervix are rarely involved, the uterus more often usually secondary to a salpingitis, and the miliary type is fairly common. Of 100 cases here reviewed, only 17 showed clinical or roentgenographic evidence of extragenital tuberculosis. Of 49 cases of renal disease, dysuria was the first symptom in 37. Cystoscopy was not done on patients in acute distress. About two-thirds of the cases investigated pathologically failed to reveal tubercle bacilli and, in all cases where found, it was of human type. Intravenous pyelography is a valuable adjunct and the rate of excretion of the dye gives an idea of the severity of the lesion. The commonest first indication of epididymitis is a painless enlargement, although acute painful forms occur. Testicular sensation is retained, helping to differentiate from syphilis, and the epididymis feels nodular. Rectal examination often reveals prostatic nodules. In tuberculous prostatitis there may be occasional dysuria with slight gummy discharge. Female genital tuberculosis may be difficult to diagnose. The discharge is less offensive than in malignant disease, in the case of endometritis. The same general principles of treatment hold for any form of tuberculosis. Febrile patients or those with sinuses are kept in bed. In renal tuberculosis abundant fluids mitigate the discomfort. Heliotherapy must be carefully graduated. Tuberculin treatment is disappointing and may even be detrimental. Dysuria is treated by bladder irrigations and instillations (boric acid, silver nitrate or flavine in glycerin 1–1000), by sandalwood oil capsules and by tincture of hyoscyamus or belladonna. Dysuria due to prostatitis is the most intractable. Operative treatment necessitates early diagnosis and localization of the lesion. It is particularly applicable to renal tuberculosis. Epi-

didymectomy is not favored and orchidectomy only in the presence of sinuses. Prostatic tuberculosis usually requires only opening and drainage of abscesses.—*Genilo Urinary Tuberculosis with a Review of 100 Cases, F. Harvey, Lancet, February 6, 1937, ccxxxii, 316.*—(*A. P.*)

Tuberculous Vulvovaginitis.—*Case Report:* This is the rarest site for clinical genital tuberculosis, occurring, according to Morris, in about 2 per cent of all tuberculous lesions of the genital tract. A quarter of the cases have been reported in children but adults between 30 and 40 are not uncommonly affected. A female infant of 17 months was admitted to the London Hospital for Sick Children because of dysuria, followed after a week by swelling and sensitiveness of the vulvar region. There was a family history of tuberculosis on the father's side, both parents had active tuberculosis and the mother later died of phthisis. The child was pale, underweight and looked ill. The vulva was oedematous and inflamed and there was an ulcerated area on the left posterolateral aspect of the vaginal orifice which was very tender. The inguinal nodes were palpably enlarged and one week after admission became swollen and fluctuating. A few cc. of thick blood-stained pus were withdrawn which when stained showed many tubercle bacilli and animal inoculation confirmed this. Five weeks after admission the child was examined under a general anaesthetic. The ulcer was irregular and undermined and the surface showed bleeding granulation tissue. Section showed well formed giant cells, lymphocytes and endothelial proliferation. Scanty tubercle bacilli were demonstrable with the Ziehl-Neelsen stain. No evidence of other pelvic or urinary tract foci was discovered. The Mantoux test with 1:10,000 dilution was positive. A chest X-ray film showed a calcified node at the right hilum. The child was treated with X-rays and ultraviolet radiation, iron and codliver oil. Later she progressed favorably under sanatorium treatment. The condition has been fully described by Jameson and others. It usually occurs in persons with tuberculosis elsewhere. The mode of infection is difficult to ascertain. Either descending spread or haematogenous or lymphatic invasion or direct contamination is a possibility. The contamination may be venereal. In this case the vulva may have been contaminated by the parents. Trauma increases susceptibility. In morphology the lesion may be ulcerative or hypertrophic, the former being more common. Involvement of the inguinal nodes is usually late. Diagnosis may be difficult as Koch bacilli may be quite few.—*Tuberculous Vulvovaginitis, V. A. J. Swain, Lancet, April 10, 1937, ccxxxii, 868.*—(*A. P.*)

A Case of "Auto-Prostatectomy" Due to Tuberculosis.—A man of 26 years of age had a tuberculous left kidney and ureter removed eight years ago. Six years later he returned with evidence of prostatic tuberculosis. Two months ago, after a period of general hygienic treatment, he was feeling well but had dribbling following urination. The cystourethrogram showed the prostatic tissue to be entirey extruded through numerous dilated ducts in the urethral floor and replaced by a diverticulum bounded by the prostatic capsule and opening into the prostatic urethra. Both external and internal urinary sphincters were normal. As soon as this cavity emptied he would become continent. The bladder was normal but the floor of the prostatic urethra was perforated with numerous dilated prostatic ducts. *Verumontanum* and ejaculatory ducts appeared normal and there was no evidence of epididymitis or seminal vesiculitis. The infection was evidently carried by the urine through the prostatic ducts into the prostate and nature then successfully took care of its own destructive products. No similar case was found in a casual search of the literature. —*A Case of "Auto-Prostatectomy" due to Tuberculosis, T. N. Hepburn, New England Jour. Med., October 8, 1936, ccxv, 653.*—(*A. P.*)

Tuberculosis of Tongue.—Ten cases of tuberculosis of the tongue are reported, eight of which were found in a group of 404 cases of tuberculosis of the upper respiratory passages. The author describes seven forms of tuberculous involvement of the tongue which are: miliary, characterized by miliary nodules under the mucous membrane and in the deeper layers of the tongue; tuberculoma, which is an isolated infiltration; tuberculous ulcer; tuberculous fissure, which is a fissure with a deep seated tuberculous ulcer; cold abscess of the tongue, an extremely rare form; verrucose papilloma; lupus of the tongue. The tuberculous infiltration and the tuberculous ulcer constitute 70 per cent of all forms of tuberculosis of the tongue. Of the author's ten cases, four had tuberculous infiltration diagnosed by biopsy, three had tuberculous ulceration, one verrucose papilloma, one cold abscess and one miliary tuberculosis of the tongue. The author concludes that tuberculosis of the tongue constitutes 2 per cent of all forms of tuberculosis of the upper respiratory passages. The

prognosis is most favorable in the isolated forms of tuberculosis of the tongue. Surgical treatment offers the best chances for cure.—*Clinical Aspects of Tuberculosis of the Tongue, A. P. Raspopov, Probl. Tuberk., 1936, no. 7, 980.*—(*W. A. Z.*)

Tuberculosis of Tongue and Mucous Membranes.—The anatomical distribution of thirty-five cases of tuberculosis of the mucous membrane in the mouth were: tongue 24, lips 5, hard palate 3, gums 3. Thirty-one patients were men and four women. The ages were between thirty and fifty. Twenty-five patients of the group received tuberculin therapy according to the method of Denys-Sahli. The results were: anatomical and clinical cure 7, improved 14, no change 3, progression 1. Pain disappeared in all cases after the first few injections.—*Tuberculin Therapy in Tuberculosis of the Tongue and Mucous Membrane of the Mouth, S. M. Kusnetsova & F. I. Melman, Probl. Tuberk., 1936, no. 7, 987.*—(*W. A. Z.*)

Tuberculosis of Appendix.—The frequency of appendiceal involvement in intestinal tuberculosis is variously estimated. It rarely gives clinical signs and it is uncertain how early the involvement takes place. When discovered postmortem there are usually multiple intestinal lesions. In all cases of appendicitis its incidence seems to be from 1 to 3 per cent. This paper is based on material from 84 necropsies on tuberculous subjects, in 50 of whom careful histological examination was done. From these it is concluded that the appendix is involved in about 50 per cent of cases of secondary intestinal tuberculosis. In 3 cases it was the only portion of the tract involved. In these, abdominal symptoms, if present, had been insignificant, epigastric pain after meals, short attacks of vomiting. The general appearance of the organ was not typical but suggested a diffuse catarrhal process.—*Intestinal Tuberculosis Limited to the Appendix, W. Pagel & E. Weichherz, Brit. Med. Jour., December 26, 1936, no. 3964, 1305.*—(*A. P.*)

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